

NISTTech

Thermometer Based On Dielectric Electromagnetic Resonators

Inexpensive, robust industrial thermometer, sensitive to below the 10 mK level

Description

This sapphire whispering gallery thermometer (SWGT) is very robust and resistant to mechanical shock. It is extremely sensitive, and provides reproducible readings below 10 mK. The temporal stability of sapphire as the thermometry material is expected to provide excellent long-term thermometric reproducibility. Temperature sensitivity and stability of response, as exhibited by measurement uncertainty determination, of less than 10 mK have been demonstrated. Initial testing indicates that further performance improvements may result in sensitivity and stability well below the 10 mK level.

Applications

- **Manufacturing/industrial**
Thermometer and humidity sensor

Advantages

- **Robust**
Resistant to mechanical shock
- **Long-lasting, reproducible**
Stability of sapphire provides thermometric reproducibility
- **Sensitivity and certainty in calibration**
Reliably measures below 10 mK
- **Inexpensive**
Does not require an expensive AC resistant bridge for readout devices

Abstract

A thermometer is provided. A housing has at least one opening. A dielectric element is disposed in the housing. At least one microwave guide is coupled to the at least one opening for providing a signal into the dielectric element for propagation at a resonant frequency and for receiving the signal from the dielectric element. A temperature determination unit receives the signal from the at least one microwave guide, measures the resonant frequency of the dielectric element, and determines

the temperature of the dielectric element based on a relationship between resonant frequency and temperature of the dielectric element.

Inventors

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Citations

1.

Strouse, G.F., "Sapphire Whispering Gallery Thermometer", 10th International Symposium on Temperature and Thermal Measurements in Industry and Science (Tempmeko 2007), 21-25

May 2007, for publication in the International Journal of Thermo physics

References

- U.S. Patent Application #20080285617
- Docket: 07-011

Status of Availability

This invention is available for licensing.

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